# PATENT SPECIFICATION

Application Date: Feb. 22, 1939. No. 5904/39. 525,491
" " March 10, 1939. No. 7861/39.
One Complete Specification Left: Feb. 15, 1940.
(Under Section 16 of the Patents and Designs Acts, 1907 to 1939).
Specification Accepted: Aug. 29, 1940.

PROVISIONAL SPECIFICATION
No. 5904 A.D. 1939.

## Improvements in Steam Valves

We, KARL BAUMANN, of "Lacey Oaks", Styal Road, Wilmslow, in the County of Chester, a subject of the King of Great Britain, and METROPOLITAN-VICKERS ELECTRICAL COMPANY LIMITED, of Number One, Kingsway, London, W.C.2, a British Company, do hereby declare the nature of this invention to be as follows:—

This invention relates to steam valves of what is known as the balanced double-beat type and has for its object to construct improved valves of this type in which the velocity of steam through the valve for a given pressure drop is increased so that the dimensions of the valve for the passage of a given weight of steam per hour are reduced.

According to the invention in order to attain this object the channels by which the steam approaches and recedes from the valve seats are made respectively convergent and divergent whereby when the valve is open the velocity of the steam in its passage towards the valve seats gradually increases and on leaving the valve seats diminishes so that the steam attains substantially its maximum velocity as it passes over the valve seats.

In double-beat valves of existing well known types, the outer cylindrical portion of the valve is usually connected to the boss through which the valve spindle passes by means of radial ribs which together with the boss obstruct the passage of the steam.

In valves according to the present invention the boss may be arranged outside the steam pass and the ribs connecting the valve to the boss arranged at the largest diameter possible, the steam flowing across them in a radial direction. Thus a large area can be provided and the velocity of the steam can be kept low in a part where the direction of the flow of steam changes. The ribs can conveniently be streamlined so as to reduce the pressure drop.

In such a construction the valve proper is free to expand symmetrically as a simple body and is not subject to distortions such as occur with the older type of valve.

By this means the valve seat diameter for the passage of a given weight of steam per hour for the same pressure drop can be made less than would be the case with a double-beat valve of the ordinary type.

In one construction the valve seats are ground so that the tangents thereto will converge to a common apex in the centre line of the valve whereby differential expansion which may occur in the valve seats and the valve itself does not affect the proper seating of the valve on both seats.

Valves of the improved construction are particularly suitable for use in a turbine governing system in which the valves are opened by oil-operated power pistons as the reduction of the out-of-balance force enables smaller operating gear to be employed and a great sensitivity obtained, while the reduction obtainable in leakage with the valve closed is also important.

The invention is not, however, limited to valves for this particular use.

Dated the 22nd day of February, 1939.
A. S. CACHEMAILLE,
Chartered Patent Agent.
Number One, Kingsway, London, W.C.2,
Agent for the Applicants.

PROVISIONAL SPECIFICATION
No. 7861 A.D. 1939.

## Improvements in Steam Valves

We, KARL BAUMANN, of "Lacey Oaks", Styal Road, Wilmslow, in the County of Chester, a subject of the King of Great Britain, and METROPOLITAN-

[*Price* 1/-]



Price 33p

VICKERS ELECTRICAL COMPANY LIMITED, of Number One, Kingsway, London, W.C.2, a British Company, do hereby declare the nature of this invention to be as follows:—

This invention relates to steam valves of what is known as the balanced double-beat type, and has for its object to provide an improved construction of steam valve which is particularly applicable to valves embodying the invention set forth in the specification filed with our Application No. 5904, applied for on 22nd February 1939, with which invention the present invention is or may be considered to be cognate.

In the improved construction according to the present invention the two seats of a double-beat valve are connected by means of a hollow cylindrical member which locates the seats in the correct relative position. Said member is provided with small perforations through which the steam passes and thus acts as a strainer to prevent foreign matter passing through the valve.

In carrying out the invention the seats may be either made in one piece with the cylindrical connecting portion so as to consist, for example, of a single casting, or the seats may be separate parts secured in the correct position at the ends of the cylindrical member.

Although, the invention is chiefly intended for valves having convergent and divergent channels by which the steam approaches and recedes from the valve seats as described in the specification hereinbefore mentioned, its use is not limited to these particular valves but it may be employed with double-beat steam valves of any ordinary constructions.

Dated the 10th day of March, 1939.
F. W. LETALL,
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Agent for the Applicants.

COMPLETE SPECIFICATION

## Improvements in Steam Valves

We, KARL BAUMANN, of "Lacey Oaks", Styal Road, Wilmslow, in the County of Chester, a subject of the King of Great Britain, and METROPOLITAN-VICKERS ELECTRICAL COMPANY LIMITED, of Number One, Kingsway, London, W.C.2, a British Company, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to steam valves of what is known as the balanced double-beat type and has for its object to construct improved valves of this type in which the velocity of steam through the valve for a given pressure drop is increased so that the dimensions of the valve for the passage of a given weight of steam per hour are reduced.

According to the invention in order to attain this object the channels by which the steam approaches and recedes from the valve seats are made respectively convergent and divergent whereby when the valve is open the velocity of the steam in its passage towards the valve seats gradually increases and on leaving the valve seats diminishes so that the steam attains substantially its maximum velocity as it passes over the valve seats. By this means the valve seat diameter for the passage of a given weight of steam per hour for the same pressure drop can be made less than would be the case with a double-beat valve of the ordinary type.

In double-beat valves of existing well known types the outer cylindrical portion of the valve is usually connected to the boss through which the valve spindle passes by means of radial ribs which together with the boss obstruct the passage of a part of the steam.

In valves according to the present invention the boss may be arranged outside the steam pass and the ribs connecting the movable portion of the valve to the boss arranged at the largest diameter possible, part of the steam flowing across them in a radial direction. Thus a large area can be provided and the velocity of the steam can be kept low in a part where the direction of the flow of steam changes. The ribs can conveniently be streamlined so as to reduce the pressure drop.

In such a construction the valve proper is free to expand symmetrically as a simple body and is not subject to distortions such as occur with the older type of valve.

In one construction the conical valve seats are ground so that the slant sides thereof will converge to a common apex in the centre line of the valve whereby differential expansion which may occur in

the valve seats and the valve itself does not affect the proper seating of the valve on both seats.

The improved valve seats may be connected by means of a hollow cylindrical member which locates the seats in the correct relative position. Said member is provided with small perforations through which the steam passes and thus acts as a strainer to prevent foreign matter passing through the valve. The seats may be either made in one piece with the cylindrical connecting portion so as to consist, for example, of a single casting, or the seats may be separate parts secured in the correct position at the ends of the cylindrical member.

In the accompanying drawing, which shows by way of example a valve constructed in accordance with the invention,

Fig. 1 is a vertical sectional view, the left-hand side showing the valve in the closed position and the right-hand side showing the valve in the open position.

Figs. 2 and 3 show parts of the left-hand side of Fig. 1 drawn to an enlarged scale.

Referring to the drawing, 1 is a casing having an entry passage 2 and an exit passage 3 for the steam. Within the casing between the entry and exit passages is secured a shell 4 which carries an upper valve seat 5 and a lower valve set 6. The casing is indicated in dot and dash lines as its specific form is not of importance; the entry passage 2 surrounds the shell 4.

The valve spindle 7 is provided with a boss 8 which carries the movable part 9 of the valve by means of depending ribs 10. The ribs may be streamlined in the direction of the steam flow. The movable part 9 of the valve which has a large central orifice 11 surrounding the spindle is formed externally with the upper and lower valve seats 12 and 13 to co-operate with the fixed valve seats 5 and 6 respectively. As shown in the drawing the annular channels indicated at 14 by which the steam approaches the valve seats from the entry passage 2 when the valve is open are made convergent in the direction of the steam flow while those marked 15 by which the steam leaves the valve seats are made divergent in the direction of the steam flow so that the steam attains substantially its maximum velocity as it passes over the valve seats. In the construction shown the valve seats are ground so that the slant sides thereof as indicated by the broken lines *a*, *b* will converge to a common apex *c* in the axis of the spindle 7. The shapes of the valve seats are shown in Figs. 2 and 3 of the drawing which are enlargements of parts of the left-hand side of Fig. 1 which are correspondingly numbered. Fig. 2 is a view of the lower seat 5 in contact with the valve 9 and Fig. 3 is a similar view showing the lower seat 6 in contact with the valve. The fixed valve seats 5 and 6 are connected by a cylindrical member 16 forming part of the shell 4 which locates and maintains the seats 5 and 6 in their correct relative position. The member is provided with small perforations 17 to act as a strainer for the steam.

Valves of the improved construction are particularly suitable for use in a turbine governing system in which the valves are opened by oil-operated power pistons as the reduction of the out-of-balance force enables smaller operating gear to be employed and a greater sensitivity obtained, while the reduction obtainable in leakage with the valve closed is also important.

The invention is not, however, limited to valves for this particular use.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:—

1. A balanced double-beat steam valve in which the channels by which the steam approaches and recedes from the valve seats are made respectively convergent and divergent whereby the velocity of the steam in its passage towards the valve seats gradually increases and on leaving the valve seats gradually diminishes so that the steam attains substantially its maximum velocity as it passes over the valve seats.

2. A steam valve according to claim 1 in which the valve spindle carries a boss which is arranged outside the steam pass and the movable portion of the valve is carried from the boss by connecting ribs across which the steam flows in a direction substantially radial to the spindle when the valve is open.

3. A steam valve according to claim 1 in which the conical valve seats are ground so that the slant sides thereof will converge to a common apex in the centre line of the valve.

4. A steam valve according to claim 1 in which the valve seats are connected together through a cylindrical member which locates the seats in the correct relative position, said cylindrical portion forming part of a shell enclosing the movable portion of the valve and being provided with perforations through which the steam passes when the valve is open.

5. A steam valve constructed substantially as described and shown in the

accompanying drawing.

Dated the 4th day of January, 1940.
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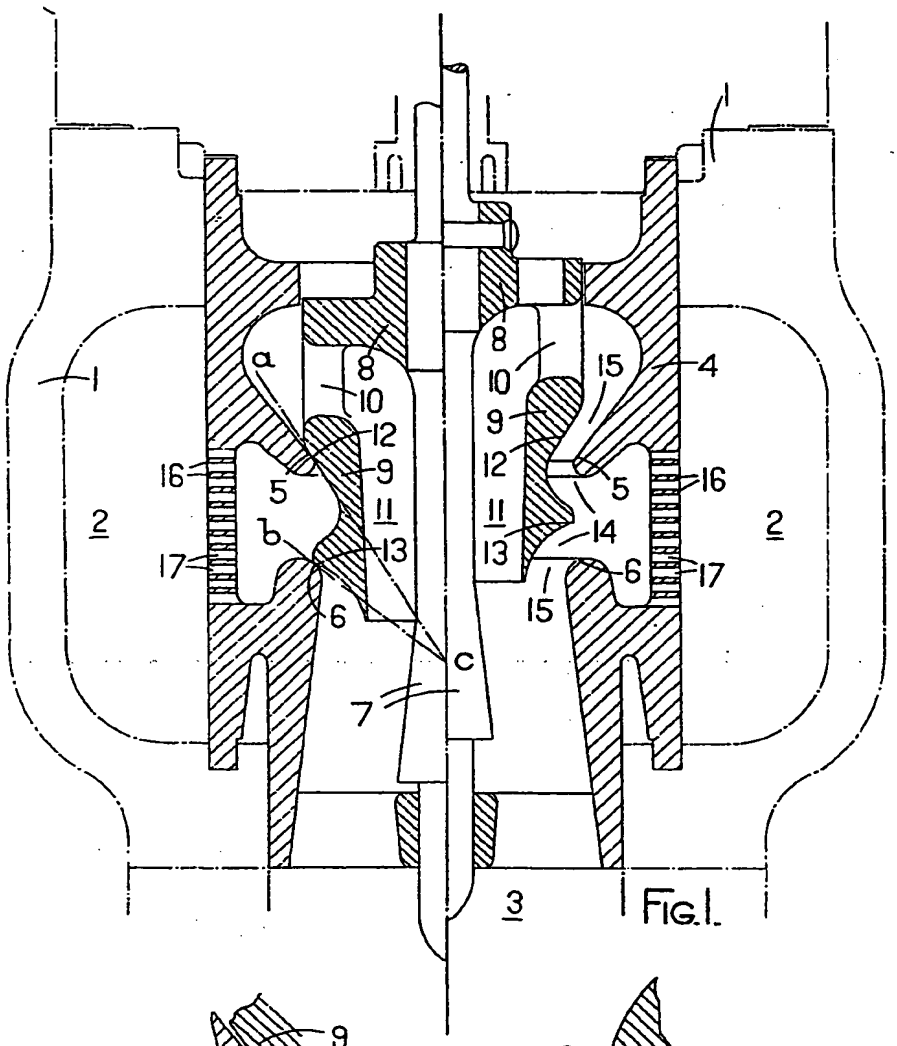


FIG. 1.

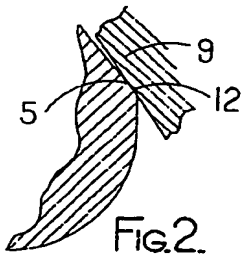


FIG. 2.

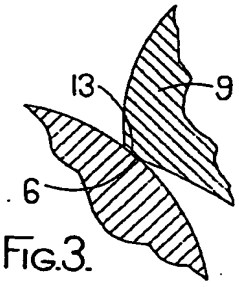


FIG. 3.

[This Drawing is a reproduction of the Original on a reduced scale.]



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